4.177 Black carbon concentrations and size distributions of surface snow at Antarctica from April to December in 2011.

Early Career Scientist

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Abstract:

Black carbon (BC) has a significant positive radiative forcing effect because 1) atmospheric BC absorbs the solar radiation strongly and 2) BC deposited on snow/ice packs reduces the snow/ice albedo. Reduction of the snow/ice albedo depends not only on the amount of BC in snow/ice (hereafter, BC-Snow) but also on its size distribution. In this study, we measured 30 of the BC-Snow concentrations and size distributions in surface snow samples collected at Syowa station (coastal station) and along traverse route between Syowa and Mizuho station (inland station), Antarctica with the 52nd Japanese Antarctic Research Expedition (2010–2012). We measured BC-Snow concentrations and size distributions by a wide-range Single Particle Soot Photometer (WR-SP2), ion concentrations, and pH in each melted water sample. Atmospheric BC concentrations were also monitored by an Aethalometer with ~300°C heated air inlet during the sampling period.
The averaged BC-Snow concentrations in the melted water samples were 591.6 (ng L^{-1}) with minimum and maximum values of 49.9 (ng L^{-1}) and 2681.2 (ng L^{-1}), respectively. The BC-Snow concentrations were lower in winter (May to September) than those in other

seasons at Syowa station. The BC-Snow concentrations in Mizuho route were higher than those at the Syowa station. The BC-Snow size distributions showed an increase in small particles (~100-200 nm) for winter samples, whereas large particles (>600 nm) were also detected in summer samples. The atmospheric BC concentrations increased around August, the result differs from the snow samples. Concentrations of ions and pH in snow samples had no seasonal variations. These results firstly showed detailed BC-Snow concentrations and air as well as their size distributions in the Antarctica and provide useful information to evaluate the BC transportation in this region and its radiative forcing effect.